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EFFECT OF PACLOBUTRAZOL ON QUALITY, YIELD AND YIELD ATTRIBUTES IN MANGO (*MANGIFERA INDICA* L.) CV. BANGANAPALLI UNDER COASTAL ZONE OF ANDHRA PRADESH INDIA

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ABSTRACT

A field experiment was conducted during 2024–2025 at the Horticultural Research Station, Dr. YSR Horticultural University, Venkataramannagudem, to study the effect of paclobutrazol on flowering, yield and fruit quality of mango (*Mangifera indica* L.) cv. Banganapalli under coastal Zone of Andhra Pradesh. The experiment was laid out in a factorial randomized block design with sixteen treatment combinations consisting of 2 factors i.e time of application (July, August, September, and October) and dosage of paclobutrazol (0, 10, 15, and 20 ml/tree) replicated thrice. Application of paclobutrazol at 20 ml/tree in September was the most effective and producing the highest number of fruits per tree (116), maximum fruit yield (7.62 t/ha), and better fruit quality with higher total soluble solids (17.45 °Brix). October application resulted in the least number of days to panicle emergence (105 days) but flowering was recorded during 4 th February). In comparison, July and August month PBZ applications induced flowering much earlier by calendar date (5th December and 18th December). It can be concluded that paclobutrazol application at 20 ml/tree in September is recommended for achieving higher yield and fruit quality.

***Key words*:** Mango, Paclobutrazol, Early flowering,Yield and Quality.

Introduction

Mango (*Mangifera indica* L.), referred as the “king of fruits,” is an evergreen tree that is widely cultivated in tropical and subtropical regions around the world. It is a member of the genus *Mangifera* and belongs to the family Anacardiaceae. The mango is believed to have originated in the Indo-Burma region, including Northeast India, Northern Burma, and the Himalayan foothills (Singh, 1987). India is the world’s largest producer of mangoes yielding 21.79 million tons annually from 24 million hectares (Anonymous,2023). In India, approximately 25% of the total area under mango cultivation is in Uttar Pradesh and Andhra Pradesh followed by Bihar, Karnataka, Kerala, and Tamil Nadu. In Andhra Pradesh alone 43.5 lakh metric tons of mangoes are produced from 1.31 lakh hectares of cultivation (Anonymous, 2023). The major mango-growing districts in the state include West Godavari, Kadapa, Srikakulam, Ananthapur, Krishna, Vijayanagaram, and Chittor.

Low yield in the mango cultivar Banganpalli in Andhra Pradesh is caused by several factors. Poor and inconsistent flowering, along with little or no fruit set, is a major reason for reduced production. Climate fluctuations particularly temperature variations during flowering and fruit set have been associated with irregular blooming and weak fruit set in Banganpalli (Bhagwan *et al*., 2011)

Flower induction technologies present an effective approach to address challenges in mango cultivation.

Table 1: Effect of different doses and time of application of paclobutrazol on days taken for panicle emergence in mango cv. Banganapalli.

Treatments	D_1 (10ml PBZ)		D_2 (15 ml PBZ)		D_3 (20ml PBZ)		D_4 (No PBZ)		Mean (T)
T_1 (Jul)	134.00	Dec 11th	131.33	Dec 8th	128.00	Dec 5th	202.00	Feb 17th	148.83
T_2 (Aug)	117.00	Dec 25th	114.00	Dec 22nd	110.00	Dec18th	171.00	Feb 15th	128.00
T_3 (Sep)	109.00	Jan 17th	105.00	Jan 13th	101.00	Jan 9th	138.00	Feb 15th	113.25
T_4 (Oct)	104.00	Feb 11th	100.00	Feb 7th	97.00	Feb 4th	120.33	Feb 27th	105.33
Mean (D)	116.00		112.58		109.00		157.83		123.85
Factors	SE m ±				CD at 5%				
T	0.225				0.652				
D	0.225				0.652				
T×D	0.451				1.305				

These methods have been successfully applied in countries such as Thailand, the Philippines, Japan, and India. For off-season flowering, chemicals like potassium nitrate, ethephon, and paclobutrazol are commonly utilized. (Galan and Fernandez, 1987). Paclobutrazol (PBZ) is a triazole compound that functions as a growth retardant by inhibiting gibberellin biosynthesis. As a plant growth regulator, it has shown considerable potential in controlling vegetative growth in fruit trees thereby promoting flowering, fruit set, and overall yield (Voon, 1997). Trees treated with paclobutrazol exhibit increased levels of the hormone abscisic acid and the chlorophyll component phytol, both of which support growth and overall health. The treatment also induces morphological changes in leaves including smaller stomatal pores, thicker foliage, more numerous and larger surface appendages, and greater root density enhancing tolerance to environmental stress and resistance to diseases. Furthermore, paclobutrazol possesses fungicidal properties due to its triazole structure, which inhibits sterol biosynthesis (Chaney, 2005).

Materials and Methods

The field experiment was carried out during 2024–2025 at the Horticultural Research Station, Dr. YSRHU, Venkataramannagudem, Andhra Pradesh, India. The trial was laid out in a Factorial Randomized Block Design (FRBD) with 16 treatment combinations, consisting of 2 Factors *i.e.* time of paclobutrazol application (T_1-30th July, T_2-30th August, T_3-30th September and T_4-30th October 2024) and Dosage (D_1-10 ml, D_2-15 ml, D_3-20 ml, D_4-0 ml/tree). Each treatment was replicated thrice using two uniform 15-year-old *Banganapalli* mango trees per replication planted at 10 × 5 m spacing. Paclobutrazol was applied as a soil drench at 3 ft distance from the trunk in four equidistant holes (30 cm depth) using 10 L solution per tree (2.5 L per hole). Observations recorded on days to panicle emergence, no of fruits per tree, fruit yield/ tree, fruit yield/ha, TSS, Titratable acidity, Carotene content. Data were analyzed statistically using OPSTAT software (Sheoran, 1998).

Days to panicle emergence (days)

It was recorded by counting the days taken from paclobutrazol application on the tagged shoots.

Number of fruits per tree

The number of fruits per tree were counted treatment wise at harvest. The result was expressed as number of fruits per tree.

Table 2: Effect of different doses and time of application of paclobutrazol on no. of fruits/tree in mango Cv. Banganapalli.

Treatments	D1	D2	D3	D4	M
T_1 (Jul)	79.34	92.67	95.85	31.00	**74.71**
T_2 (Aug)	71.56	87.67	95.67	30.67	**71.39**
T_3 (Sep)	78.67	88.33	116.00	36.67	**79.92**
T_4 (Oct)	70.00	101.33	96.33	33.67	**75.33**
Mean (D)	**74.89**	**92.50**	**100.96**	**33.00**	
Factors	SE m±		CD at 5%		
T	0.323		0.935		
D	0.323		0.935		
T×D	0.647		1.871		

D1: D_1 (10ml PBZ); **D2:** D_2 (15 ml PBZ); **D3:** D_3 (20ml PBZ); **D4:** D_4 (No PBZ); **M:** MEAN (T)

Table 3: Effect of different doses and time of application of paclobutrazol on fruit yeild/tree(kg) in mango Cv. Banganapalli.

Treatments	D1	D2	D3	D4	M
T_1 (Jul)	20.25	26.38	30.76	5.70	**20.77**
T_2 (Aug)	16.60	29.28	25.31	5.15	**19.08**
T_3 (Sep)	21.21	25.85	38.12	6.24	**22.85**
T_4 (Oct)	20.14	30.46	32.97	6.35	**22.48**
Mean (D)	**19.55**	**27.99**	**31.79**	**5.86**	
Factors	SE m±		CD at 5%		
T	0.156		0.451		
D	0.156		0.451		
T×D	0.312		0.903		

D1: D_1 (10ml PBZ); **D2:** D_2 (15 ml PBZ); **D3:** D_3 (20ml PBZ); **D4:** D_4 (No PBZ); **M:** MEAN (T)

Table 4: Effect of different doses and time of application of paclobutrazol on fruit yeild/ha(tonnes) in mango Cv. Banganapalli.

Treatments	D1	D2	D3	D4	M
T_1 (Jul)	4.05	5.27	6.15	1.14	**4.15**
T_2 (Aug)	3.32	5.85	5.06	**1.02**	**3.81**
T_3 (Sep)	4.24	5.17	7.62	1.24	**4.57**
T_4 (Oct)	4.02	6.09	6.59	1.27	**4.49**
Mean (D)	**3.91**	**5.59**	**6.35**	**1.17**	
Factors	**SE m±**		**CD at 5%**		
T	0.031		0.090		
D	0.031		0.090		
T×D	0.062		0.180		

D1: D_1 (10ml PBZ); **D2:** D_2 (15 ml PBZ); **D3:** D_3 (20ml PBZ); **D4:** D_4 (No PBZ); **M:** MEAN (T)

Fruit yield per tree (kg)

Total numbers of fruit per plant was multiplied by average fruit weight and calculated it kg per tree.

Fruit yield/hectare (t)

To calculate yield /hectare divide the total weight of the harvested fruit by the areas size in hectares.

$$\text{Yield (tons/hectare)} = \frac{\text{Total weight of harvest (tons)}}{\text{Area (hectares)}}$$

Total soluble solids (%)

TSS (%) was measured using a hand refractometer by placing a juice drop on the prism and reading ºBrix at the shadow line. The instrument was calibrated with distilled water prior to observation (Ranganna,1986).

Titratable Acidity (%)

Titratable acidity (%) was estimated by diluting 10 ml homogenized sample to 100 ml, filtering, and titrating 10 ml aliquot against 0.1N NaOH using phenolphthalein indicator. The end point was a light pink colour persisting for 15 s, expressed as % citric acid (Ranganna, 1986)

$$\text{Acidity (\%)} = \frac{\text{Titre value} \times \text{Normality of NaOH} \times \text{equivalent weight of acid}}{\text{Aliquot taken} \times \text{Weight of sample}} \times 100$$

Factor for acidity

= 1ml of N/10 NaOH = 0.0064g of citric acid

Carotene content (mg/100g)

Five grams of sample was extracted with acetone and anhydrous sodium sulphate, and the pooled supernatant was partitioned with petroleum ether in a separatory funnel. The upper layer was collected and volume made up to 100 ml with petroleum ether. Optical density was recorded at 425 nm using a Thermo Evolution 201 spectrophotometer with petroleum ether as blank (Srivastava and Sanjeev, 2014).

$$\text{Carotene content (mg/100g)} = \frac{\text{O.D.} \times 13.9 \times 10^3}{\text{Weight of sample} \times 560 \times 1000}$$

Results and Discussions

Days to panicle emergence (days)

During July month application of paclobutrazol @ 20ml/tree (T1D3) recorded earliest flowering (Dec 5th - 2024) took 128 days compared to control (Feb 17th- 2025) took 202 days (T1D4). It could be attributed to retardation of gibberellin synthesis by PBZ has proved to be promising for flower initiation in shoot bud giving early and profuse flowering subsequently increases the fruit yield in mango. similar results were also reported by Kumar *et al.*, (2019), Patel *et al.*, (2016) and Yeshitela *et al.*, (2004) in mango.

No. of fruits/tree

During september month paclobutrazol application @ 20ml/tree (T3D3) recorded more number of fruits/ tree (116) followed by @ 15ml/tree in the month of october recorded (101) fruits/tree compared to control recorded minimum no of fruits/tree (30.67) in the month of August (T2D4).The increase in fruit count in trees treated with PBZ @ 20 ml/tree may be attributed to production of a higher proportion of reproductive shoots, the presence of more hermaphrodite flowers and improved fruit retention upto maturity by diversion of more photoassimilates, nutrients and hormones to the young developing fruits than in untreated trees (control) as earlier reported by Maiti *et al.*, (1972). Similar results

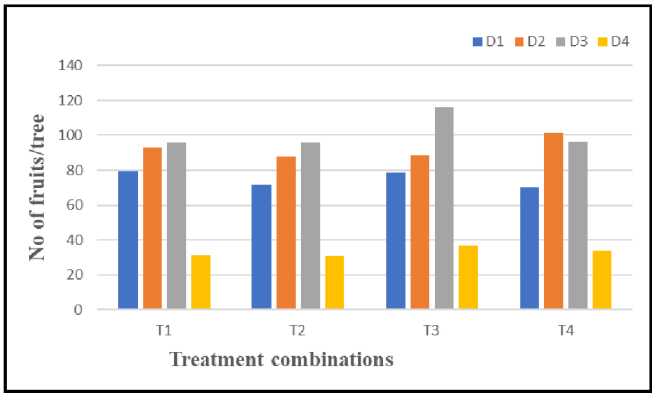

Fig. 1: Effect of different doses and time of application of paclobutrazol on number of fruits per tree.

Time of application of Paclobutrazol (T)

T_1 : July 30th 2024

T_2 : August 30th 2024

T_3 : September 30th 2024

T_4 : October 30th 2024

Dosage of Paclobutrazol used (Cultar) (D)

D_1 :10ml/10 lit of water/tree

D_2 :15ml/10 lit of water/tree

D_3 :20ml/10 lit of water/tree

D_4 : 0ml/lit (Water Spray)

Table 5: Effect of different doses and time of application of paclobutrazol on TSS in mango Cv. Banganapalli.

Treatments	D1	D2	D3	D4	M
T_1 (Jul)	15.13	15.62	16.68	14.21	**15.41**
T_2 (Aug)	15.35	15.93	15.98	14.65	**15.47**
T_3 (Sep)	15.87	15.90	17.45	14.70	**15.98**
T_4 (Oct)	15.22	17.41	16.45	14.68	**15.94**
Mean (D)	**15.39**	**16.22**	**16.64**	**14.56**	
Factors	**SE m±**		**CD at 5%**		
T	0.059		0.172		
D	0.059		0.172		
T×D	0.119		0.344		

D1: D_1 (10ml PBZ); **D2:** D_2 (15 ml PBZ); **D3:** D_3 (20ml PBZ); **D4:** D_4 (No PBZ); **M:** MEAN (T)

were reported by Patel *et al.*, (2016) in mango cv. Alphonso, Leal *et al.*, (1997) in mango cv. Haden, Thandel and Patel (2010),Narvariya *et al.*, (2015) in mango cv. Dashehari, Tin Mou Phyu (2016) in mango cv.Seintalone, and Sonam *et al.*, (2017) in Litchi.

Fruit yield / tree (kg)

In September, the application of paclobutrazol @ 20 ml/tree (T3D3) resulted in the highest fruit yield per tree (38.12 kg), followed by the October application @ 20 ml/ tree (T4D3) with 32.97 kg. In contrast, the control treatment (T2D4) applied in August recorded the lowest yield (5.15 kg/tree). It might be due to Paclobutrazol application had influences the source sink dynamics in mango by promoting more fruit development than vegetative growth, leads to higher fruit yield. Comparable findings were also documented by Maiti *et al.*, (1972) in

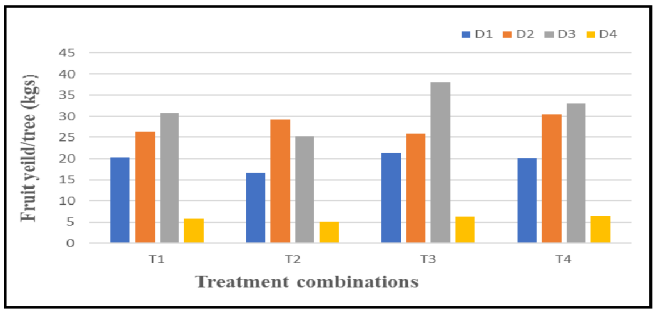

Fig. 2: Effect of different doses and time of application of paclobutrazol on fruit yield per tree.

Time of application of Paclobutrazol (T)

T_1 : July 30th 2024

T_2 : August 30th 2024

T_3 : September 30th 2024

T_4 : October 30th 2024

Dosage of Paclobutrazol used (Cultar) (D)

D_1 : 10ml/10 lit of water/tree

D_2 : 15ml/10 lit of water/tree

D_3 : 20ml/10 lit of water/tree

D_4 : 0ml/lit (Water Spray)

Table 6: Effect of different doses and time of application of paclobutrazol on Titratable acidity in mango Cv. Banganapalli.

Treatments	D1	D2	D3	D4	M
T_1 (Jul)	1.25	1.29	1.37	1.15	**1.26**
T_2 (Aug)	1.22	1.35	1.37	1.19	**1.28**
T_3 (Sep)	1.22	1.40	1.36	1.21	**1.30**
T_4 (Oct)	1.27	1.36	1.45	1.21	**1.32**
Mean (D)	**1.24**	**1.35**	**1.39**	**1.19**	
Factors	**SE m±**		**CD at 5%**		
T	0.005		0.014		
D	0.005		0.014		
T×D	0.010		0.028		

D1: D_1 (10ml PBZ); **D2:** D_2 (15 ml PBZ); **D3:** D_3 (20ml PBZ); **D4:** D_4 (No PBZ); **M:** MEAN (T)

mango, Vijayalakshmi and Srinivasan (1998) in mango, Burondkar *et al.*, (2000), Shinde *et al.*, (2000),Yeshitela *et al.*, (2004) and Narvariya *et al.*, (2015) in mango.

Fruit yield / ha (tonnes)

During september month application of paclobutrazol @ 20ml/tree (T3D3) recorded the maximum fruit yield/ ha (7.62 t ha^{-1}) followed by @ 20 ml/tree in the month of october (T4D3) recorded (6.59 t ha^{-1}) compared to control (T2D4) recorded the minimum fruit yield/ha (1.02 t ha^{-1}) in the month of August.It might be due to Paclobutrazol application had influences the source sink dynamics in mango by promoting more fruit development than vegetative growth, leads to higher fruit yield. Comparable

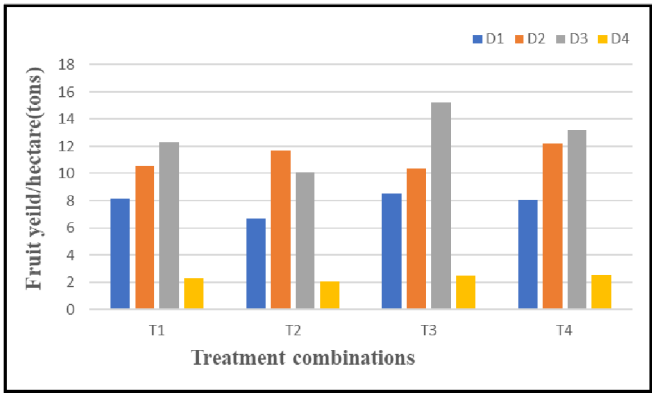

Fig. 3: Effect of different doses and time of application of paclobutrazol on fruit yield/hactare.

Time of application of Paclobutrazol (T)

T_1 : July 30th 2024

T_2 : August 30th 2024

T_3 : September 30th 2024

T_4 : October 30th 2024

Dosage of Paclobutrazol used (Cultar) (D)

D_1 : 10ml/10 lit of water/tree

D_2 : 15ml/10 lit of water/tree

D_3 : 20ml/10 lit of water/tree

D_4 : 0ml/lit (Water Spray)

findings were also documented by Maiti *et al*., (1972) in mango, Vijayalakshmi and Srinivasan (1998) in mango, Burondkar *et al.,* (2000), Shinde *et al.,* (2000), Yeshitela *et al.,* (2004) and Narvariya *et al.,* (2015) in mango.

TSS content (°Brix)

In September, the application of paclobutrazol at 20 ml/tree (T3D3) recorded the highest TSS content (17.45 °Brix), which was statistically on par with the treatment combination T4D2 (15 ml/tree applied in October) that recorded 17.41 °Brix. In contrast, the control (T1D4) applied in July showed the lowest TSS content (14.21 °Brix). Paclobutrazol application can enhances the total soluble solids (TSS) and reduces acidity in fruits by accelerating the breakdown of polysaccharides into sugars. It also promotes efficient carbohydrate movement from source tissues to fruiting sites. These physiological shifts improve fruit sweetness and overall quality. Such effects are consistent with findings by Vijaylakshmi & Srinivasan (2000) in mango cv. Alphonso, Singh & Ranganath (2006) in mango, Reddy *et al.,* (2013) in mango cv. Totapuri, Yeshitela *et al.,* (2004) in mango cv. Tommy atkins, Narvariya *et al*., (2015) in mango cv. Dashehari, sonam *et al.,* (2017) in Litchi and Kumar *et al*., (2019) in mango cv. Dashehari.

Titratable acidity (%)

During October month application of paclobutrazol @ 20ml/tree (T4D3) recorded minimum acidity content (0.12%) Which was on par with the treatment combination of T3D2 *i.e.* @15ml/tree in the month of September (0.13%) compared to control (T2D4) recorded maximum acidity content of (0.26%) in the month of August. The PBZ application at higher doses had reduced the acidity of fruit pulp during the ripening phase can be attributed to the rapid breakdown of organic acids into sugars. These findings are coincide with the findings of Joshi and Roy (1985), Vijayalakshmi and Srinivasan (2000) in mango cv. Alphonso, Baskaran and sathiamurthy (2008) in mango. Sonam *et al.,* (2017) and Kumar *et al*., (2019) in mango.

Carotene content (mg/100gm)

During October month application of paclobutrazol @ 20ml/tree (T4D3) recorded maximum β carotene content (1.45mg/100gm) followed by the treatment combination of T3D2 *i.e.* @15ml/tree in the month of September (1.40mg/100gm) compared to control recorded minimum β carotene content (1.15mg/100g) in the month of July (T1D4). It might be due to Higher doses of PBZ application had increases carotenoid content in mango by stimulating photosynthesis and reducing the vegetative growth which redirects the more resources towards fruit development and promotes carbohydrate accumulation leads to more pigment synthesis in fruit pulp. The carotenoid is an antioxidant, and its presence in fruit is a key indicator of phytonutrient composition and improve overall fruit quality. Similar results were reported by Reddy *et al*., (2014) in mango, Auxcilia *et al.,* (2010) in papaya and Jain and Dashora (2011) in guava, Reddy *et al.,* (2013) in mango cv. Totapuri, Kumar *et al.,* (2019) in mango cv. Dashehari.

Conclusion

It can be concluded that the experimental findings revealed that applying paclobutrazol at 20 ml/tree in September was the most effective treatment, resulting in superior performance with respect to No of fruits/tree (116), Fruit yield/tree (38.12kg), Fruit yield/ha (7.62 t ha^{-1}), TSS (17.45 °Brix).

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References

Auxcilia, J., Subramanian K.S. and Suresh R. (2010). Effect of paclobutrazol on growth, yield and quality of papaya (*Carica papaya* L.). *Acta Horticulturae*, **851**, 395-402.

Baskaran, V. and Sathiamoorthy S. (2008). Effect of paclobutrazol on flowering and quality in mango. *South Indian Horticulture*, **56(1-6)**, 48-52.

Bhagwan, A., Reddy Y.N. and Kurian R.M. (2011). Effect of environmental factors on flowering and fruit set in mango (*Mangifera indica* L.). *Indian Journal of Horticulture*, **68(1)**, 60-65.

Burondkar, M.M., Gunjate R.T., Magdum M.B. and Govekar M.A. (2000). Effect of paclobutrazol on flowering, fruiting and fruit quality in mango (*Mangifera indica* L.) cv. Alphonso. *Acta Horticulturae*, **525**, 459-462.

Chaney, W.R. (2005). Growth retardants: A promising tool for managing urban trees. *Purdue Extension Publication FNR-252-W*. Purdue University, USA.

Galan Saúco, V. and Fernandez M. (1987). Flower induction and regulation for off-season production of tropical and subtropical fruits. *Acta Horticulturae*, **199**, 153-164.

Jain, M.C. and Dashora L.K. (2011). Effect of paclobutrazol on yield and quality of guava (*Psidium guajava* L.). *Indian Journal of Horticulture*, **68(3)**, 381-384.

Joshi, G.D. and Roy S.K. (1985). Effect of paclobutrazol on flowering and fruiting in mango. *Acta Horticulturae*, **158**, 335-342.

Kumar, P., Reddy Y.T.N., Prasad K.V.S.V. and Ramachander S. (2019). Influence of paclobutrazol on flowering, yield and fruit quality of mango (*Mangifera indica* L.) cv. Dashehari. *Journal of Pharmacognosy and Phytochemistry*, **8(2)**, 1612-1617.

Leal, F., Gazit S. and Nakasone H.Y. (1997). Paclobutrazol and productivity of mango (*Mangifera indica* L.) cv. Haden in Florida. *Acta Horticulturae*, **455**, 393-400.

Maiti, S.C., Mitra S.K. and Bose T.K. (1972). Studies on fruit bud differentiation in mango. *Indian Journal of Horticulture*, **29**, 262-266.

Narvariya, S.C., Singh R., Mishra D.S. and Shukla P.K. (2015). Effect of paclobutrazol on growth, flowering and fruiting of mango (*Mangifera indica* L.) cv. Dashehari. *Plant Archives*, **15(2)**, 811-815.

Patel, R.K., Patel V.B. and Patel B.N. (2016). Effect of paclobutrazol on flowering, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso. *International Journal of Agriculture Sciences*, **8(58)**, 3281-3284.

Ranganna, S. (1986). Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Edn. Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1-1112.

Reddy, Y.T.N., Kurian, R.M., Ramachander, S. and Prasad, K.V.S.V. (2013). Effect of paclobutrazol on growth, yield and quality of mango cv. Totapuri. *Journal of Horticultural Sciences*, 8(2): 181–184.

Reddy, Y.T.N., Upreti K.K., Kurian R.M. and Prasad K.V.S.V. (2014). Paclobutrazol induced changes in carbohydrates and their metabolism in relation to flowering in mango (*Mangifera indica* L.). *Scientia Horticulturae*, **169**, 67-70.

Shinde, A.K., Burondkar M.M. and Gunjate R.T. (2000). Paclobutrazol induced flowering and fruiting in mango. *Indian Journal of Plant Physiology*, **5(2)**, 120-123.

Singh, L.B. (1987). The Mango: Botany, Cultivation and Utilization. ICAR, New Delhi.

Singh, V. and Ranganath H.R. (2006). Effect of paclobutrazol on fruit quality in mango (*Mangifera indica* L.). *Karnataka Journal of Agricultural Sciences*, **19(2)**, 364-366.

Sonam, J., Singh A.K. and Kumar S. (2017). Effect of paclobutrazol on flowering, fruiting and quality of litchi (*Litchi chinensis* Sonn.). *International Journal of Current Microbiology and Applied Sciences*, **6(10)**, 2482-2489.

Srivastava, R.P. and Sanjeev K. (2014). Fruit and Vegetable Preservation: Principles and Practices. 3rd Edn. CBS Publishers & Distributors Pvt. Ltd., New Delhi, 1-484.

Thandel, K.M. and Patel N.L. (2010). Effect of paclobutrazol on flowering and fruit yield of mango (*Mangifera indica* L.) cv. Kesar. *Asian Journal of Horticulture*, **5(2)**, 380-382.

Tin Mou Phyu (2016). Effect of paclobutrazol on flowering and fruit yield of mango (*Mangifera indica* L.) cv. Sein Ta Lone. *Journal of Agricultural Research*, **4(2)**, 91-96.

Vijayalakshmi, D. and Srinivasan C. (1998). Effect of paclobutrazol on flowering and yield in mango (*Mangifera indica* L.). *South Indian Horticulture*, **46(1/2)**, 1-4.

Vijayalakshmi, D. and Srinivasan C. (2000). Effect of growth retardants on flowering and fruiting of mango cv. Alphonso. *Journal of Applied Horticulture*, **2(1)**, 50-52.

Voon, C.H. (1997). Paclobutrazol and its application in tropical fruit trees. *Acta Horticulturae*, **463**, 489-494.

Yeshitela, T., Robbertse P.J. and Stassen P.J.C. (2004). Paclobutrazol suppressed vegetative growth and improved flowering and fruiting of mango trees. *South African Journal of Plant and Soil*, **21(4)**, 251-256.